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REPORT OF LIVE STOCK CONDITIONS IN IMPERIAL
COUNTY, CALIFORNIA

BY
CHESTER L. ROADHOUSE AND FRED M. HAYES.



Short-horn Cattle in Imperial Valley.

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We wish to acknowledge our indebtedness to a large number of residents of the valley for their kindly coöperation, and to Mr. David N. Morgan, Instructor in Agriculture in the Imperial High School, in 1909-10, for much valuable assistance.

REPORT ON LIVE STOCK CONDITIONS IN IMPERIAL VALLEY.

By CHESTER L. ROADHOUSE, D.V.M.

Imperial County is one of the most important stock producing sections in the State of California. The two conditions which contribute largely to the success of the live stock industry in this section are: first, an abundance of good feed; second, easy access to market.

The most extensively grown food for stock in the county is alfalfa. The warm climate, deep, fine-grained soil and excellent irrigation facilities combine to make an almost ideal condition for the growth of this plant, which is an excellent food for all classes of live stock. Most of the improved land in all parts of the country is devoted to large alfalfa fields upon which scattered herds of cattle, sheep or hogs graze. Barley, Indian corn, Kaffir corn, and Milo maize are also grown to a considerable extent as animal feeds. A very common practice among hog raisers is to plant barley early in the fall; use it as green pasture for hogs during the winter; and after it has matured in the early part of the summer, the hogs are again used for harvesting. Barley combined in this way with green alfalfa pasture has given satisfaction as a feed for hogs during their growing period.

The second condition which contributes to the success of the live stock industry in Imperial County, that of easy access to market, is brought about by the location of the valley, only 200 miles from an important meat packing center at Los Angeles. The stock industry is increased by the fact that the valley lies between this market and the arid stock ranges of New Mexico, Arizona, and Mexico. Cattle are shipped into this intermediate valley with its abundance of good feed, and there fattened before being sent on to the Los Angeles market. This stock-fattening industry is rapidly growing.

The following table, prepared from the reports of the Imperial County Live Stock Inspector, shows the extent of the live stock shipments into the valley:

IMPORTATIONS OF LIVE STOCK INTO IMPERIAL COUNTY.

June 1, 1909, to June 1, 1910.

	Horses.	Mules.	Cattle.	Hogs.	Sheep.	Goats.
June -----	40	17	2,408	-----	2,015	500
July -----	8	43	423	-----	-----	-----
August -----	50	6	-----	-----	-----	-----
September -----	228	34	1,064	5	-----	-----
October -----	296	66	1,655	97	20	-----
November -----	102	437	2,494	2	-----	-----
December -----	237	22	171	-----	8,611	-----
January -----	117	65	1,461	100	-----	-----
February -----	78	103	178	4	-----	-----
March -----	37	27	1,247	-----	-----	-----
April -----	118	45	886	-----	1,600	-----
May -----	9	140	1,923	-----	-----	-----
Total -----	1,320	1,005	13,910	208	12,246	500

It will be noted from the above table that a large number of horses have been shipped into Imperial County. They are being used for work and for breeding purposes. Mules are the most satisfactory for farm use during the hot summer weather. Of the 13,910 cattle shipped into the county during the year covered by the above table, the greater part of them are cattle shipped into the alfalfa section for fattening, to be sent on later to the Los Angeles market for beef. The hogs, sheep and goats sent into the valley are used almost entirely for breeding purposes.

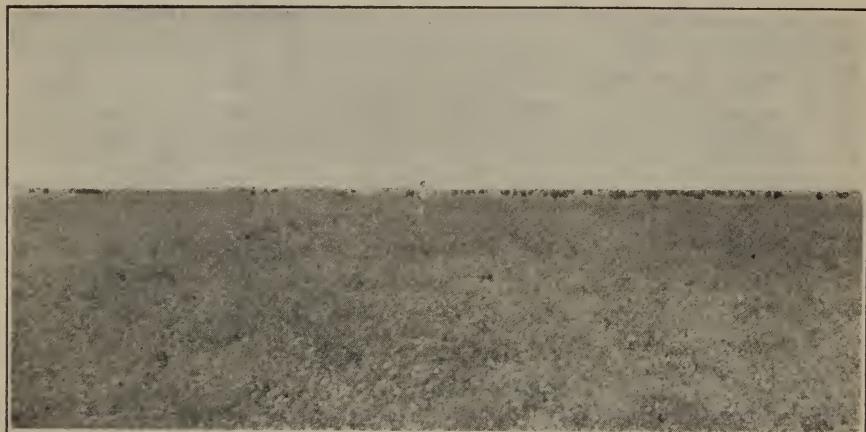


FIG. 1.—Alfalfa field for fattening beef cattle.

The extent of the sales of live stock from Imperial County as a result of animals raised in that section, as well as those shipped into the valley for the purpose of fattening, is shown from the following data supplied by the transportation company:

NUMBER OF CAR LOADS OF LIVE STOCK SHIPPED FROM IMPERIAL COUNTY.

January 1, 1909, to April 30, 1910—Calendar year 1909.

Station.	Horses.	Cattle.	Sheep.	Hogs.	Total.
Bernice -----				13	13
Brawley -----	11	15	2	183	211
Calexico -----	4	105	41	41	191
El Centro -----		6	13	206	225
Heber -----	1	5	25	22	53
Imperial -----	1	202	26	127	356
Total -----	17	333	107	592	1,049

January to April, inclusive, 1910.

Brawley -----	21	-----	34	55
Calexico -----	64	64	6	145
El Centro -----	26	8	61	95
Heber -----	2	-----	15	17
Imperial -----	36	3	20	62
Total -----	149	75	136	374
Grand total -----	482	182	728	1,423

DAIRYING IN IMPERIAL COUNTY.

The dairy industry is rapidly developing. It is reported that there are 15,000 dairy cows in the valley. The dairy owners are receiving good returns for their product. Since feed grows here throughout the entire year the high market in winter does not materially affect the industry in this valley because of the available pasturage.

Dairying, as a business in Imperial County, is not well conducted. The dairy methods and equipment in general are far from what they should be for the manufacture of a high-grade product. It would not be possible to produce market milk for city supply under the conditions



FIG. 2.—Milk house at C. M. Co.'s ranch, Calexico.

that prevail. There are very few milking stables where the animals can be properly secured during milking and sheltered from the hot sun in summer, and there are few milk rooms where the milk and cream can be well handled. Corral milking is a common practice, and under Imperial conditions is one from which clean milk can not be obtained. Good milk must be clean. Dairy cows should not be milked out of doors where they can lie in manure and where the manure dust is allowed to blow into the milk bucket during milking. Bacteria which enter the milk with manure in this way bring about by their growth and multiplication the most objectionable changes in the milk.

There are three creameries operating in Imperial County. These are located at Imperial, El Centro, and Brawley. The daily output of butter for the month of June, 1910, follows:

Imperial creamery -----	4,000 pounds.
El Centro creamery-----	2,000 pounds.
Brawley creamery -----	1,000 pounds.

In addition to the manufacture of $3\frac{1}{2}$ tons of butter, there is a daily shipment of 800 pounds of cream from Imperial to Los Angeles.

There are three breeders of pure-bred cattle in the valley, but the general milk supply is produced largely from the average grade of Shorthorn, Holstein, and Jersey cows.



FIG. 3.—Herd of pure bred Jersey cattle near Heber.

INVESTIGATION OF ANIMAL DISEASES IN IMPERIAL COUNTY.

Various diseases of live stock had been reported as being present in Imperial County, and this was the reason for conducting this investigation of live stock conditions in the valley. The following diseases of live stock were found present:

DISEASES OF CATTLE.

I. *Acute Keratitis (inflammation of the cornea in cattle).*

This disease was found on several ranches in Imperial County, and is incorrectly known among stockmen as "Pink Eye." The disease is characterized by extreme sensitiveness of the affected eye. It is usually closed, with a profuse flow of tears and a disposition to resist opening of the lids. When exposed, the cornea is seen to be more or less clouded. One or both eyes may be affected. The extensive inflammation of the eye may develop to the formation of pus between the layers of the covering of the eye, and to the formation of an ulcer, or even to a perforation of the ball and the escape of the fluid of the eye.

Cause. Wounds by foreign bodies, spikes of vegetables, blows of whips, or insects, stings, etc., have been known to cause this condition. It may also be the extension from acute, enzootic, infectious conjunctivitis, as has been noticed by a great many observers, and this would be expected to be the cause of the cases seen in Imperial, from the fact that where the disease was present in the valley there was usually more than one case.

Treatment. In treating diseases of the eye, some special knowledge is necessary for the best results. It is possible, however, for the unskilled to get good results in treating this disease if the treatment is

applied in the first stages. The first symptom is a simple inflammation of the eye, and at that time a saturated solution of boracic acid, dropped into the eye three or four times daily, will prove beneficial. Pyotkannin, 1:1000 solution is also recommended.

II. *Tuberculosis.*

The following information has been furnished by Mr. D. N. Morgan, formerly instructor in agriculture in Imperial High School:

Large numbers of dairy cows have been shipped into Imperial Valley during the past two years. Many of them come from herds whose reputation for healthfulness has been questionable.

The passing of city and county ordinances in some of the neighboring counties prohibiting the sale of milk from tuberculous animals has encouraged dairymen to get rid of their suspicious animals at any price. That some of these animals have tuberculosis is evidenced by the recent losses some of our hog dealers have encountered on account of the frequency of tuberculosis in swine. One hog buyer refuses to purchase hogs fed on skim milk from dairies. Another buyer recently had a third of a car load condemned at the abattoir on account of being tuberculous. With the above facts in mind, an endeavor has been made to find out what percentage of the dairy cows already in the valley have tuberculosis.

In April, 1910, the University of California offered to make tuberculin tests for dairymen, free of charge. The dairymen were asked to pay only for the materials used and for actual breakage. About twenty owners of herds requested that their animals be tested. Of this number seven of the largest herds were tested. It was first intended to test all, but for reasons mentioned later in this paper that work had to be indefinitely postponed, much to the regret of the writer.

The first herd tested consisted of seventeen cows. They had been in the valley about a year and a half when tested, and were the first pick from a bunch of some two hundred that were brought in by one of our leading cattle buyers. All of these seventeen were found free from tuberculosis. This herd was located in the Mesquite Lake region.

The next bunch of thirty-nine head consisted of two herds brought together to facilitate testing. One cow from the herd of fifteen gave a typical reaction and three cows from the other twenty-four were found to be affected. These animals had all been brought in from one of the coast counties two years previously.

Three grade Holsteins were next tested. They were found free from the disease. One of them came from the outside, the others being raised in the valley.

A dairy herd of twenty-four head was next tested. One of this bunch was found with the disease. She was a well developed heifer with her first calf and had been purchased near Pomona some fourteen months previously.

A large dairy on the east side was next visited. Fifty-six animals were here tested, every one of them passing the test without a single reactor. This herd had been purchased in Orange County some two years before. Since the test these cows have been sold for eighty-five dollars per head. On this dairy ranch a large number of hogs were turned off annually. Many of them are fattened exclusively on skim milk from these cows and the owners reported that they have not up to date had any hogs condemned.

Sixty-five cows near Brawley were next tested. Of this bunch, four were found diseased. One was a bull that had been bought outside the valley when a calf. The owner having changed his herd in the past so often was unable to recall the original homes of the other diseased animals. However, they had been shipped in from the outside. This last test was conducted the fore part of July. The thermal conditions at that time were such that before the test was completed, nine thermometers were broken by heat. This breakage was due to the fact that the atmospheric temperature was some ten degrees higher than the instruments were graduated and the

breakage took place in the interval between temperatures. Most of the temperatures were taken at night.

Under the circumstances it seemed advisable to postpone the other testing until fall or winter. It would then not only be easier on the cattle, but on the operators as well.

All of the above reported tests were made in the usual way, two preliminary temperatures and five subsequents, and in suspicious cases seven of the latter. Standard doses of tuberculin were injected, the animals either tied or stanchioned and every precaution taken to have the tests reliable.

The board of supervisors of Imperial County on hearing the preliminary reports of the small percentage of tuberculosis disclosed by the above tests very wisely passed an ordinance prohibiting the importation of dairy cattle that had not been officially tested for tuberculosis. This is the first step toward ultimately ridding the valley of the disease. The supervisors, county veterinarian, and dairy inspector should be given assistance in the enforcement of the above-mentioned ordinance. For when the time comes that the Imperial Valley dairy products are guaranteed free from tuberculosis, the demand will be so great that prices offered will be unlimited. Our milk-fed hogs will no longer be discriminated against, and every resident of the valley will be benefited by the prosperity.

From the above data furnished by Mr. Morgan it appears that the dairy cows in the Imperial Valley are not affected with tuberculosis as extensively as are the dairy animals in many other portions of the State.

Total number of cows tested-----	204
Total number of cows reacting-----	9
Per cent of reactions-----	4.4

DISEASES OF HORSES.

I. *Summer Sore.*

Summer sore, sometimes called bursatti, is a disease of horses and mules of frequent occurrence in Imperial County. In the writer's opinion it is yet to be proven that this is the disease commonly known as bursatti, in British India. In California summer sore is found present most frequently in hot, moist climates at low altitudes. The affected animal seldom suffers the first attack before the first of June, but may at any time from that date until the middle of October. If the animal has had one attack and the sores apparently heal with the advent of cool weather, they may reappear at any time after the first of April the following year. The months of July and August bring forth the greatest number of cases.

SYMPTOMS AND CHARACTERISTICS OF THE DISEASE.

The disease begins with a slight local swelling, heat and pain, a thickening of the skin and the tissues immediately beneath. The thickened portion gradually decreases from the center outward, but leaves a well-defined base. In from two to ten days small spots like the pointing of an abscess may be seen. The hair falls out, and drops of yellowish, watery fluid exude. Across these points the skin will break and a malignant sore is formed. Cattle in Imperial Valley were not reported as having suffered with the disease.

This has proved to be one of the most important of the various diseases found, for the reason—first, that considering the size of the valley there were many cases; and, second, that no particular treatment had proven satisfactory.

The term “bursatti” is derived from the Indian word “Bursat,” meaning *rain*. The term literally means *rain-sore*. In this connection it is interesting to observe that the annual rainfall in the valley is less than four inches, and that there is no rain between the months of June and October, the period during which the disease develops. The affected animals, however, had been allowed to stand in water during the hot part of the day, sometimes with the water reaching to the body. It is quite possible that this condition encourages the development of the disease; just as rain aggravates the disease condition in other sections of the United States.

Since 1904, twenty-one cases of this disease have developed in the Imperial Valley. The ages of the animals affected varied from nine months to twenty-five years. The lesions were located at the following points: Breast, lumbar region, abdomen, side of face, prepuce, mammae, front of forearm, legs below the knees and the fetlocks. The legs below the knees and hocks and lower parts of the body suffer most frequently.

In all of these cases the animals were allowed free access to standing water, which in many cases was stagnant, covered with fungi and filled with insects of various kinds. Some of the animals that developed the disease had stood with the water reaching to the body during the hot part of the day. On one ranch, three cases developed in one season, and one case had developed the previous year. Another ranch developed three cases the same year, and there are other ranches from which two cases are reported. My observations were confined to four animals.

Case No. 1.

Mule, 25 years old, was in fair flesh, developed the disease June 1, 1910, and was brought to me for treatment on June 7th. The lesion was located on the breast.

Symptoms. Lesions: There was considerable local swelling and thickening of the skin and the tissues immediately beneath. This swelling, well-circumscribed, extended over an area of about six by eight inches; in the center of the swelling was a fistula $\frac{1}{2}$ inch in diameter, which drained a necrotic area extending about 2 inches into the tissues and turning almost at right angles and continuing about three inches further beneath the skin and subcutaneous tissue. The hair was falling out over a small area surrounding the opening of the fistula and a yellowish, watery fluid, sometimes resembling bloodstained serum, and which is characteristic of summer sore, exuded from the wound drop by drop, slowly but continually. This fluid was later seen to be secreted only from the granulating tissue.

Treatment. Operated immediately, removing a section of tissue 4 inches by 6 inches and $2\frac{1}{2}$ inches deep, which included most of the swollen, thickened tissue around the wound and all tissue which had an unhealthy appearance. Within a week excessive granulating tissue had developed at two points within the wound. This tissue continued to grow and spread rapidly despite the following treatment. Washed thoroughly once daily with three per cent solution of carbolic acid, followed by covering the wound thoroughly with dusting powder composed of boracic acid, salicylic acid, acetanilid and iodoform. Carbolic acid and salicylic acid have been recommended for use in this disease, as they destroy fungi readily, and the disease was reported by Fish and Bitting to be caused by a fungus found locally in the lesions. After one week, lysol was substituted for the carbolic acid, and with the dusting powder was continued throughout the treatment. The wound was covered completely with antiseptic cotton held in place by a bandage passed around the body of the animal. This was necessary to keep the flies from the wound.

When this treatment failed to check the excessive granulation and watery discharge, formaldehyde full strength was used on the surface and injected into the base of the rapidly granulating tissue with a hypodermic syringe. The formaldehyde caused the animal some discomfort, but the following day the serum discharge was entirely stopped and the granulating tissue dark colored, and by the third day the dead tissue had sloughed off, leaving a healthy appearing surface with no discharge. Although the full strength formaldehyde was used, I believe that it would produce good results if used diluted—say a ten per cent solution. The treatment was continued in this way, using the formaldehyde whenever it was necessary to check the excessive granulations. The animal remained in good condition throughout the treatment, with good appetite and normal temperature. Attempts to bite the wound were noticed only once, when the bandage had loosened and dirt and flies had come in contact with the wound. A letter from the Imperial Valley, dated September 3d, reports this mule completely recovered and back at work. The recovery has taken place during the hottest weather.

Case No. 2.

Large sorrel horse, 8 years old, in good flesh. Was affected with this disease in 1909. Recovered at the advent of cool weather. June 25, 1910, the surface of the scar caused by the disease in 1909 had cracked, and was discharging a yellowish, watery fluid. There was no swelling around the lesion. I was not able to diagnose this case positively, although the discharge was characteristic of summer sore. I filled the wound with formaldehyde as before, which stopped the discharge only temporarily. Four days later a second application of the formaldehyde

stopped the discharge entirely, and it did not recur, and no further trouble has resulted.

Case No. 3.

Nine months old colt, developed the disease in September, 1909. The animal had stood in water up to its body a great deal of the time. Extensive lesions over lower part of abdomen, covering a surface 18 by

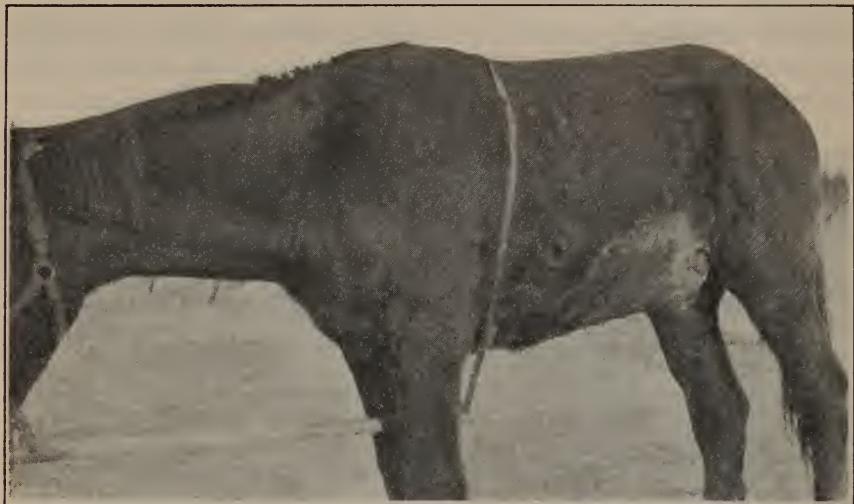


FIG. 4.—Horse No. 3, showing lesion of summer sore on wall of abdomen.

10 inches. The animal recovered temporarily February 1, 1910, but broke out again in July, affecting the sides and lower part of the abdomen and the prepuce. This animal was not treated by me.

Case No. 4.

Black horse, about 8 years old, in good flesh. Had suffered from the disease during the summer of 1908-1909, and again this past summer. Sent to University Experiment Station. The disease had been in progress several months; a lesion located on the left side of the face was secreting the characteristic yellow fluid. Lesions were also present on the right foreleg at two points below the fetlock, which showed the development of the characteristic granular deposits. The object in this case was to determine the effect of the cool coast climate on the course of the disease without further treatment except to protect the lesions at the fetlock by means of a gauze bandage.

Within a week the watery discharge from the lesion on the side of the face had ceased, and by the end of the second week, the necrotic granules had disappeared from the lesions at the fetlock, leaving a smooth, raw surface. A slight watery discharge reappeared from the lesion on the

face for a few days when the hot weather developed, but soon disappeared, and the lesions are gradually healing.

In the Review of Recent Facts in Tropical Medicine, Wellcome Research Laboratory, Volume I, reference is made to the disease as a strange complaint associated with the presence of filaria embryos in the skin and connective tissues of horses, which is common in India. Lingard concluded from a number of observations made in the Muktesar Laboratory on horses and cattle, that the filaria embryos are present in the blood of affected animals in varying numbers during the twenty-four hours, and that between six o'clock and ten o'clock in the evening the number of these embryos increases enormously. They were fewer



FIG. 5.—Horse No. 4, showing partially healed lesions of summer sore.

during the month of September than they were during the months of June and July.

The *filaria irritans* is reported from Europe as being the cause of the disease bursatti, and the embryos are reported to have been found in the circulating blood.

In America the filaria embryos have not been reported as having been found present in the blood or within the tissues of the lesions of animals suffering with this disease.

With a view of determining the presence of these filaria embryos, microscopic examinations of the blood of cases Nos. 1 and 4 were made. Wright's stain was used in the preparation of the blood smears.

Case No. 1.

Number of blood smears examined, 50.

Number of fresh cover glass preparations examined for motility, 20.

Case No. 4.

Number of blood smears examined, 30.

Number of fresh cover glass preparations examined for motility, 10.

Professor Herms of the Entomological Department of the University of California assisted me in the examination of slides for the presence of filaria, and in no case did we find the embryos present.

Blood examination of case No. 4 showed the following:



FIG. 6.—Partially healed lesion of summer sore on pastern.
Horse No. 4.

Red blood corpuscles, per c. m., 8,008,000.

Leucocytes, 16,200.

Hemoglobin, 100 per cent.

Eosinophiles, 10 per cent in proportion to the total number of leucocytes.

The number of leucocytes present in case No. 4 was increased about 10,000 per c. m. above the normal. The increase in the number of eosinophiles was marked, and instead of about 4 per cent as reported by Moore, Haring, and Cady for normal horses, 10 per cent of eosinophiles were found in this animal.

Microscopic examinations of sections from the borders of the lesion from which the watery discharge is secreted were made by the pathologist at the Cooper Medical College, San Francisco, and showed the lesion

to be of a rapidly granulating type containing an increased number of eosinophiles.

I realize the need for further investigation on this disease in this country. The Agricultural Experiment Station of the University of California will continue observations on case No. 4, with a view of bringing about a recurrence of the disease by taking the animal to a hotter section of the State at the beginning of next summer. Further observations will be made relative to this and other cases at that time.

In conclusion, I would say:

First, that we were successful in treating summer sore by excising the diseased tissues as completely as possible, followed by the application of antiseptic solutions and dusting powders.



FIG. 7.—Partially healed lesion of summer sore on fetlock. Horse No. 4.

Second, that strong solutions of formaldehyde proved effective in checking the secretions and excessive granulations without noticeable ill effects to the animal.

Third, that animals suffering with extensive forms of the disease can be treated more successfully by removing them to cool climates where the disease is not apt to recur.

II. *Chronic Dermatitis in Horses.*

A chronic inflammation of the skin of horses characterized by the production of epidermic scales, which usually attacks the head, neck, chest or tail first to form fine scales like wheat-bran or a fine dust-like

flour. As the disease develops further, the scurf thickens in some cases to form thick scales, and the hair becomes thin over the diseased surface. Old horses, on account of having a drier skin and thinner hair, are more subject to the disease than the young. In some cases the mane and tail alone become affected. The dry and hard scurf which forms over the affected surface causes the hair to drop out.

Cause. The exact cause of this affection is uncertain, but it is likely that several influences are brought to bear in bringing about the trouble. A long-continued and exclusive diet of green feed, such as alfalfa pasturage, has been known to encourage the development of skin diseases. Dust and other irritating substances on the skin and the hot sun of summer, all probably contribute to the cause of this affection.

The *bacillus necrophorus*, the organism causing *necrotic dermatitis* in pigs, is thought by Mohler to have to do with inflammations of the skin of other animals, and there is a possibility that it may have to do with the chronic dermatitis of horses.

Treatment. One horse at Imperial suffering from this disease was treated as follows:

Clipped off the long hair around the diseased area and washed thoroughly with green soap to remove the scurfy layer of skin. Washed the affected surface with a three per cent solution of creolin once daily, followed by an application of ichthyol to protect the surface from sun and dirt and to keep the skin soft. Internal treatment consisted of purgatives, diuretic, and an arsenic preparation which is indicated in chronic skin diseases.

Under this treatment the animal showed material improvement, and was sold to another owner who did not continue the treatment. On account of the limited amount of time further experiments with this disease were not possible.

Chronic dermatitis in horses in Imperial County is causing a great deal of trouble. Many animals are affected to a greater or less extent, and although they are not incapacitated for work, they have an unthrifty appearance, and fall off in condition due to the irritation and rubbing of the skin, mane and tail.

The farmers are helpless in the control of this affection of horses in Imperial Valley; and it is very desirable that further work be done in the investigation and treatment of this disease.

THE SHEEP AND GOAT INDUSTRY.

The sheep industry is growing in favor in Imperial Valley and is being developed rapidly. On account of the death of young pigs from the different causes, a few of the former hog raisers have directed their attention toward the sheep industry. One firm alone has about 30,000



FIG. 8.—Goats and alfalfa field near Calexico.

head of sheep. It is predicted that the Imperial Valley will soon supply the entire Los Angeles market with spring lamb.

Diseases of sheep in Imperial County have not been reported as having been present at any time.

SWINE RAISING IN IMPERIAL COUNTY.

Imperial County is the most important hog-growing section in the State of California. Referring to the table on page 1196 we find that there were 728 car loads of hogs shipped from the valley during the fifteen months preceding April 30, 1910, and this exceeds the number of car loads of all other species of animals shipped from this section during the same period. Although there are a large number of hogs raised, the producers are finding that they have very heavy losses from different causes; and if these losses could be controlled their profits would be enormously increased.

Hogs are generally allowed entrance to settling basins, where they drink and wallow during the heat of summer. The water is very muddy, and often stagnant, and on account of the character of the soil in this locality the hogs that are handled in this way usually have quantities of mud clinging to their bodies. It is difficult to keep hogs perfectly healthy under these conditions, and especially in this section where the hog louse and a peculiar skin disease cause so much trouble. If they are to be given access to water a very good plan is to build a platform over the border of the settling basin and fence in the basin so that the hogs can not wallow in the mud. In this way the body of the animal is kept clean, and the water is much cleaner for the hogs to drink.

It is sometimes difficult to provide an outlet for settling basins in a country as level as is Imperial, but some care in construction will usually make it possible to provide for an outlet, which is very desirable for keeping the water fresh.

From the fact that few shade trees have been planted for the protection of live stock, it has been found desirable to construct shades, which are usually made of green alfalfa applied in a thick layer over a framework and held in place by means of wire passed over the surface of the hay. The photograph below shows a shade of this character constructed near the watering place. With this arrangement the hogs do not lie in the water for any length of time, but return soon to the shade where they spend the greater part of the day.

The native mesquite trees found occasionally in the pastures, serve

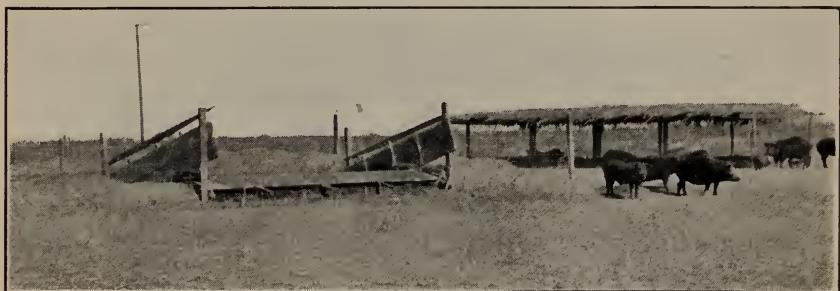


FIG. 9.—Entrance to platform leading into settling basin for watering hogs.
On the right is an alfalfa thatched shed for shade.

as an excellent shade. Eucalyptus and other trees grow very rapidly, as evidenced by the following photograph, and stock owners should take advantage of this to provide shade.

DISEASES OF HOGS IN IMPERIAL COUNTY.

Losses of hogs are due largely to the death of young pigs from a disease known as *Necrotic dermatitis*, and to the lack of thrift in young pigs and grown hogs due to the presence of the hog louse.

I. *Necrotic Dermatitis in Pigs.*

This is a disease of young pigs and hogs up to one year of age. The disease is characterized by an inflammation of the skin attacking the nose, snout, sides of face and mouth, eyelids or ears to form thin scabs. These may later thicken to form hard crusts over the skin of the head. Another form of the disease attacks the body to form raised areas in the skin which show a local inflammation, and later become covered over with a scab. The ears may become inflamed and dry up, or the tail become diseased and drop off. The disease is more extensive in young pigs up to three months old. Pigs four days old may be attacked, live two weeks and die. Constipation is frequently present in the last stages of the disease. If one pig in a litter becomes affected, usually the whole litter is lost, and pigs kept separate in an adjoining pen may not suffer from the trouble.

The above symptoms were referred to Dr. John R. Mohler, Bureau of

Animal Industry, U. S. Department of Agriculture, and he confirms the diagnosis.

Cause. In Circular 91, Bureau of Animal Industry, U. S. Department of Agriculture, Dr. Mohler describes the cause of the disease as



FIG. 10.—A good method of watering hogs.

being an organism known as the *Bacillus necrophorus*. It is highly infectious, and is believed to live normally on the healthy intestines of hogs so that the manures are sources of danger as infective agents.

There can be little doubt that the disease is primarily the result of



FIG. 11.—A poor method of watering hogs.

abrasions of the skin allowing the entrance of the infective organism, which in some localities is widely disseminated. It has been observed also that the scratches on the cheeks of sucking pigs, resulting from bites and scratches by the teeth of the other pigs of the litter during nursing frequently become infected and develop into necrotic dermatitis.

Hogs and pigs are often allowed access to settling basins and other places where they can wallow in the mud. The mud in Imperial is peculiar in forming a cement-like layer, which becomes matted in the hair over the nose and head, and becoming dried by the sun and winds may rub off, pulling hair and skin with it, and thus opening the way for the entrance of the necrosis bacillus, followed by the development of the disease.

The following data show the conditions and losses from this disease, and the observations made on the disease by several hog raisers in Imperial County:

Ranch No. 1, Holtville, California.

Hogs kept on place-----	1,000
Pigs kept on place-----	500
Pigs born each year-----	1,200
Pigs raised each year-----	700
Loss by death-----	500



FIG. 12.—Four-year-old shade trees near Calexico.

During the past three years this ranch has lost 1,500 pigs. Most of the trouble is due to a skin disease which appears in three forms:

1. Ears dry up, form crusts and peel off. Hair becomes dry and rough, and skin is red.
2. Scurf forms over back, shoulders and head. This form attacks pigs up to one year of age. Fat pigs are more susceptible. Constipation is present in the last stages. The greatest losses from this form of the disease occur during the sucking period. Without treatment none of

the pigs recover. If the pigs are attacked after six months of age they seldom die, but are left unthrifty.

3. The third form of the disease appears as scale on the muzzle and face of young pigs.

Ranch No. 2, Imperial, California.

Total number of hogs-----	250
Total number of pigs-----	150
Lost by death from necrotic dermatitis-----	75

Ranch No. 3, Imperial, California.

Number of hogs-----	600
Number of pigs-----	400
Lost from necrotic dermatitis during the year-----	300

Ranch No. 4, Imperial, California.

Number of hogs-----	400
Number of pigs-----	400
Lost from all causes during past year-----	300

Ranch No. 5, Holtville, California.

Number of hogs-----	325
Pigs lost from necrotic dermatitis during past three years-----	500

Treatment. Prevention is the most important means of keeping the hogs free from the disease, and treatment is the only means of making a diseased herd healthy.

Starting with a healthy herd of hogs and wishing to introduce new blood into the herd, it is always advisable to dip the newly arrived hogs in a disinfectant solution before allowing them to enter the herd.

If any evidence of the disease is noticeable on the animals they should not be allowed in the herd until they have been treated and have entirely recovered from the disease.

When the disease has developed in the herd, prevention should be carried out along three lines:

- (1) Separation of the sick from the healthy animals.
- (2) Close watch kept on the hogs that have been exposed to infection by contact with affected animals or premises.
- (3) Complete disinfection of all pens, corrals and sheds, as the infective organism may retain its virulence under favorable conditions in and around the hogpens for several years. The walls, fences and troughs should be sprinkled with a five per cent solution of kreso, creolin, zenoleum, or other similar disinfectant. All manure and bedding should be removed from the pens and the surface of the ground disinfected.

When the disease is actually established in the herd it is important to remember that the principal requisite is to expose properly the affected surface in order that the remedy applied may destroy the infectious matter.

Remove all scabs and particles of dried mud from the diseased surface by softening them with the disinfectant solution and then rubbing them off. Treatment by local antiseptics, such as a three per cent solution of the cresol or coal-tar dips, is very satisfactory if begun in time and applied energetically. It should not be deferred, as better results will

be obtained by immediate attention. In the early stage of the disease, dipping two days in succession, and repeated within a week, will usually give good results. In the actively progressive cases, or in aggravated, chronic forms, it is desirable to remove the scabs. Apply the dip, followed by an application of Lugol's solution to the diseased surface. Treatment is not recommended for the young pigs suffering from the chronic or extensive forms of the disease, as their value does not warrant the labor necessary for the course of treatment. They should be destroyed immediately to prevent the spread of the infection.

Although treatment may be recommended, care in the preparation of dips and their proper application is necessary in order to get good results; and it is important also to emphasize the fact that medical treat-

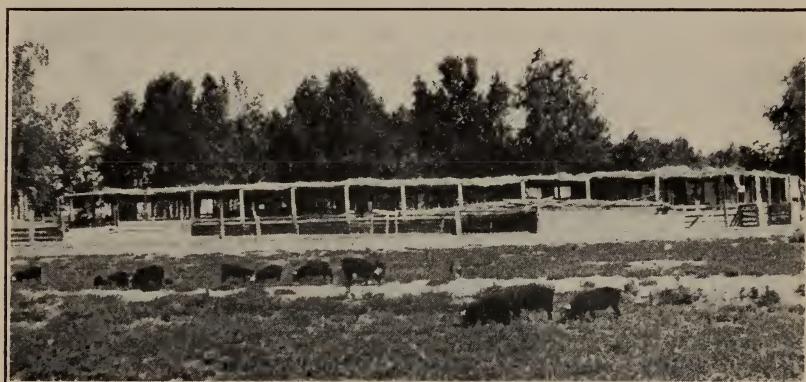


FIG. 13.—Unclean litter pens for hogs which may harbor disease germs for a long time.

ment of the disease, without the proper observance of the cleanliness of the surroundings for the animals, would not bring about a permanent cure.

This disease of pigs in Imperial has spread so generally throughout certain herds, and the losses have been so great that several of the large hog raisers have become utterly discouraged, and a few have gone out of the hog-raising business entirely. The short time allowed for the work with this disease made it impossible to conduct a thorough investigation. There has been very little published on the disease in this country, so that the progress was slow in arriving at a diagnosis.

Three rabbits were inoculated with material from the necrotic areas removed from the skin of pigs suffering from this disease. This was done with a view of isolating the infective organism. The extreme hot weather made careful work impossible. One of the rabbits died from heat exhaustion, and the other two, which were returned to the Experiment Station at Berkeley, failed to develop any lesions.

The investigation of this disease in Imperial County should be continued.

II. *The Hog Louse.*

The poor condition of health and stunted growth of some droves of hogs, where other hogs thrive on practically the same food and care, is frequently due to the presence of parasites on the skin of these animals.

Of these external parasites, the hog louse is the only one that was found to be present in Imperial. It is a bloodsucking parasite, and is large enough to be easily visible to the naked eye. When a drove of hogs is not thriving properly, a careful examination of the animals will frequently show that the unthrifty condition is directly traceable to the presence on the skin of large numbers of lice.

When lice increase in large numbers, as they are likely to do if not destroyed, the skin of the animals becomes covered with scales and sores, and in extreme cases, swelling and inflammation develop as a result of the parasites piercing the skin with their mouth-parts hundreds of times each day in their effort to secure blood for food. The irritation thus produced is a source of constant annoyance and worry to the hogs, evidenced by their restlessness and incessant rubbing and scratching against any convenient object. The ultimate effect is to seriously interfere with the growth and fattening of hogs, especially of young pigs.

The destruction of this parasite is a comparatively easy matter, and practical tests have demonstrated the economic importance of freeing hogs from the louse. It interferes with the growth, weakens the general physical condition, and as has been reported by different experimenters, renders the animals an easy prey to contagious diseases.

Treatment for the Hog Louse.

1. *Preventive Measure.* Any treatment to prove effective against lice on hogs must include preventive measures as well as destructive remedies. The sleeping quarters of lousy hogs become infested with lice, which crawl off the hogs and secrete themselves in the crevices of the woodwork and in the bedding, while the eggs on the hair that the hogs shed and rub off will hatch out young lice. These parasites in the sleeping places immediately reinfest animals from which the lice have been removed by treatment, or perhaps animals that have not been previously infested with lice. A thorough treatment, therefore, includes the destruction of the lice in the buildings and pens in addition to treatment of the animals themselves. If the pens where lousy hogs have been kept are left vacant for a period of two weeks all lice will have perished, and any new animals introduced will be in no danger of infection.

For disinfection of buildings apply a three per cent solution of any of the coal-tar preparations, such as kreso, creolin or zenoleum, to be applied with a broom or spray pump. For treating the floors, air-slaked lime having a little carbolic acid added has been recommended for dusting over the surface. Whitewash made by slaking lime with

water ($1\frac{1}{2}$ pounds to 1 gallon of water) and applying it to the surface has been found effective in combating lice in buildings.

In treating hogs infected with lice special attention should be given to those parts of the body where the lice congregate in greatest numbers. They are found principally inside, behind and in front of the ears, on the breasts, and back of the forelegs. Even with the most thorough treatment, however, some of the lice are apt to escape, and these, if not destroyed soon, increase in numbers. The eggs are not all destroyed by any single treatment. These facts make it necessary to repeat any treatment used in order to entirely eradicate these pests from a badly infested herd.

Strange hogs added to a herd should always be examined for parasites, in order that any infested animals may not be introduced to cause the spread of lice throughout the herd.

2. Treatment of the Hogs. Many different preparations have been used to destroy lice on hogs. Some that were found successful in killing the louse proved injurious to the skin of the hog.

In Bulletin No. 69 of the Bureau of Animal Industry, U. S. Department of Agriculture, the following preparations are recommended for destroying lice on hogs:

Kerosene in a ten per cent emulsion proved successful.

Creolin in a three per cent solution will destroy lice.

These may be applied by spraying or dipping in vats; the treatment to be repeated in two weeks. The latter method is more thorough and is to be preferred.

Formulas for kerosene emulsion.

(a) Hard soap, one half pound ($\frac{1}{2}$ bar common soap).

Kerosene, two gallons.

Water, one gallon.

Boil the water and soap until the latter is dissolved, remove from the fire, then add the kerosene and churn or agitate vigorously until an emulsion is formed. This emulsion if thoroughly mixed will form a gelatinous mass on cooling, it keeps indefinitely, and may be used at any time by diluting with warm water to 20 gallons. If used after cooling, the mixture should be heated again (great care must be exercised in heating a second time because of the inflammable kerosene present, and for safety the mixture should be heated out of doors) and then thoroughly mixed a second time.

(b) Sour milk, four gallons.

Kerosene, two gallons.

This formula has the advantage over the other method of making kerosene emulsion, as it avoids the necessity of making a soap mixture, the milk acting as an emulsifier.

Hogs in Imperial Valley are not thoroughly enough treated, and the treatment of buildings and hogs with the remedies is not repeated frequently enough to completely eradicate the hog louse.

In some sections of California pure kerosene has been applied to the skin of hogs for the destruction of lice. The best method of application is to place sufficient water in the dipping vat and add kerosene oil to a depth of one inch. The oil floats on the surface of the water so that the hogs when driven through the liquid, emerge with a thin coating of oil over the entire body. The application of pure kerosene to the skin of hogs has been known to produce blisters and cause the hair to fall out; thus, the caution to use it in the evening in order to avoid the effect of the sun's heat on the skin freshly wet with kerosene must be strictly observed, and care be taken not to apply the oil too freely. In using the kerosene emulsion there is practically no danger of blistering the skin.

III. *Are Pigs Killed by Ants?*

Several hog raisers in Imperial County report having had many pigs killed by ants. The following data has been furnished:

J. M. P., Holtville, California, reports a loss of 400 small pigs during the past year from ants. (The bite of a single ant is fatal to small pigs, it is claimed.)

O. N. S., Holtville, California, reports a loss of 100 to 150 small pigs from the bites of ants during the past three years.

Colonies of ants are numerous on the irrigation check banks and other elevated places over Imperial Valley. At these locations the water used for irrigating purposes can not reach the colonies and the ants thrive and increase in numbers under these conditions. The pigs lie in the soft dirt on the check banks and are here frequently bitten by the ants. Potassium cyanide poured in the ant holes is used with success for the destruction of the ants.

Dr. C. M. Haring of the State Agricultural Experiment Station, conducted experiments to determine the toxic effect of potassium cyanide for hogs, and the possible danger of poisoning hogs while destroying ants by the use of this drug. Ten grain doses of potassium cyanide failed to kill a 65-pound shoat, but 25 grains produced death in one hour and ten minutes. His results seem to show that hogs have a wonderful tolerance to potassium cyanide, but that some care must be exercised in the use of this drug in the destruction of ants.

Specimens of ants credited with the destruction of young pigs by hog raisers in Imperial County were sent to Professor C. W. Woodworth, entomologist at the State University, who recognizes them as belonging to the family, *Myrmox pogonomyrmox*, of which there are four species in California. He supposes this species to be *Pogonomyrmox californicus*.

Many ants are known to bite and sting, and farmers have often supposed they were capable of damaging stock, but Professor Woodworth reports that, so far as he knows, no literature is in existence relative to such noxious habits, and he supposes, therefore, that there is no real foundation for these reported injuries to pigs.

Considering these facts, it seems very desirable that this trouble be further investigated. The losses due to this reported paralysis in young pigs are considerable, and when the exact cause of the trouble can be determined doubtless the number of deaths from this disease can be reduced to a minimum.

IV. *Abscesses in Hogs.*

This condition in the hogs from the Imperial Valley has been recognized and complained of by the meat packers buying hogs in this locality. Although in most cases the quality of the meat of the carcass is not affected, the part where the abscess is located is discarded, and if a large abscess is located in the head or neck of a hog, the entire head is condemned under the meat inspection regulations of the United States Department of Agriculture.

Where the bodies of the hogs are covered with mud, or in any case where hogs are kept in filthy sleeping places, scratches on the body from bites of other hogs, or bruises may form abscesses. If they form in the skin or just beneath it, they can be treated successfully.

Treatment. Open the abscess freely by cutting through the skin and abscess wall. Syringe out the wound daily with a good disinfectant, such as kreso or creolin, three per cent solution, and continue the treatment until the discharge has stopped and the wound is healed. The animal must be kept out of the water and in a clean pen during treatment.

To summarize the work which we have done on the diseases of live stock in Imperial County, we conclude that the valley is comparatively free from some of the infectious diseases which cause heavy losses in other portions of the State. The valley is particularly fortunate in being comparatively free from bovine tuberculosis and Texas fever. However, there are several diseases which are especially prevalent. Necrotic dermatitis in hogs, the hog louse, loss of pigs from ant bites (?), chronic dermatitis in horses, and summer sores in horses are causing enormous losses to the live stock interests in that section of the State. On account of most of these diseases taking unusual forms in this section due to the different conditions which prevail relative to climate, soil, altitude and water supply, it seems necessary and desirable that this investigation of animal diseases in Imperial County be continued.

More complete scientific knowledge should be available relative to the cause, prevention, and treatment of these diseases under the unusual

conditions which prevail, and a veterinarian representing the State Agricultural Experiment Station should be stationed in Imperial for that purpose, in order that proper information can be furnished to the live stock owners. The fact that the specific cause of each of the above diseases, except those due to animal parasites, is not definitely known, emphasizes the importance of further investigations.

THE WATER SUPPLY.

The domestic water supply and also that used for the live stock in the Imperial Valley originates from the Colorado River, and comes into the valley through the irrigating canals. This water contains a great deal



FIG. 14.—Main canal carrying water from Colorado River into Imperial Valley.

of silt deposit; so that it has a muddy appearance. On account of this large amount of silt in the water it is not palatable for drinking purposes, and to overcome the turbidity the water is allowed to stand in

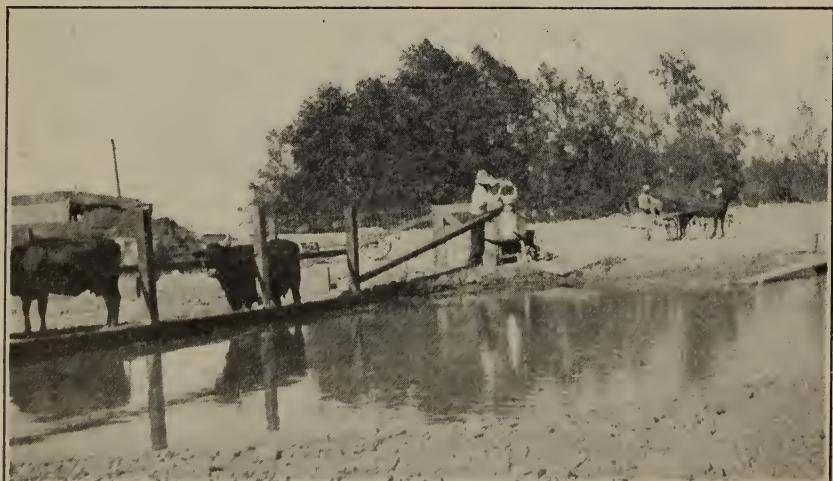


FIG. 15.—Settling basin used for water supply for live stock.

settling basins three to four feet in depth in order that the sediment may sink to the bottom leaving the water clear towards the surface.

When fresh this water is palatable and pure, as no animals are allowed



FIG. 16.—Ducks and other animals should be kept away from settling basins.

to come in contact with it in the canals. On the farm, however, it is frequently poorly handled on account of the methods adopted almost entirely throughout the valley of storing water in settling basins, where it is not kept perfectly clean and healthful.

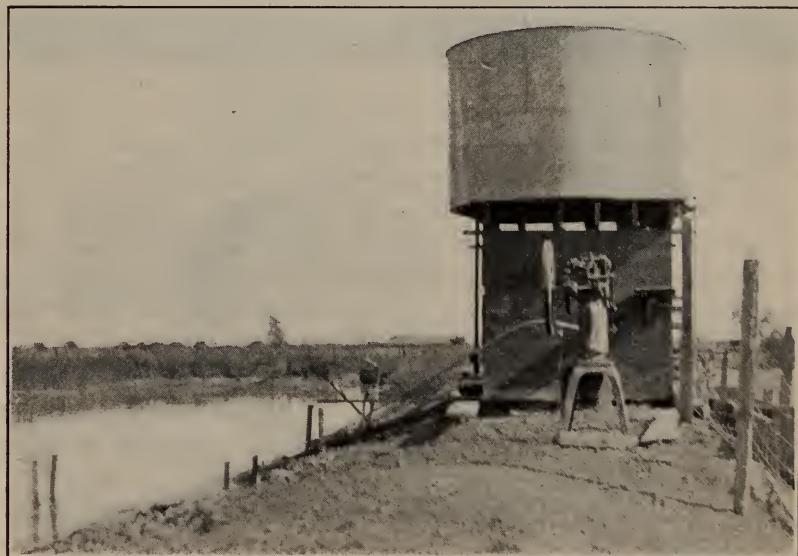


FIG. 17.—Pumping water from settling basin to storage tank.

The settling basins are generally constructed by scraping off the surface of the ground to form a basin three to four feet in depth and from

200 to 2,000 square feet in area. The water from the canals is allowed to run into these settling basins, but there is seldom an outlet through which the stagnant water that has been left in the basin can be removed.

The settling basins are seldom shaded, so that the water in summer becomes very warm, and, consequently, is not palatable for man or beast. Fungi and insects of various kinds thrive in this warm stagnant water, so that it may become reddish or greenish over the surface, or it may have a slimy appearance.



FIG. 18.—Settling basin used for water supply, covered with fungi and vegetation.

Impure water for the use of live stock encourages disease, and aggravates disease conditions which may already be present. There is absolutely no question but that the live stock in general in Imperial County would be more thrifty, and the diseases of live stock which are present in the valley would be as troublesome, if the water supply for such stock was improved.

The following steps may be taken to improve the water supply in Imperial Valley:

First—Where settling basins are used they should have an outlet as well as an inlet, so that the water may be changed completely at frequent intervals, and thus prevent its becoming stagnant.

Second—Vegetation should not be allowed to grow in the water in settling basins.

Third—Cement or concrete cisterns should be constructed so that the water can be stored after settling.

The water is free from sediment when it enters the cisterns and can be kept clean. Water kept beneath the ground in these cisterns has been

found to be at a temperature of 65 degrees F. during the heat of the day in summer, and consequently it is more palatable and healthful for animals than the hot impure water that is frequently found in settling basins.

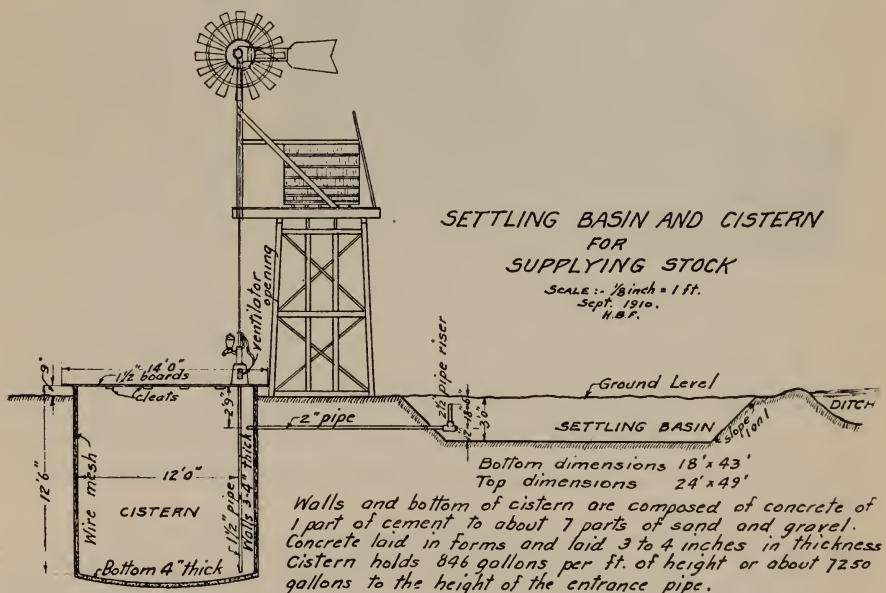
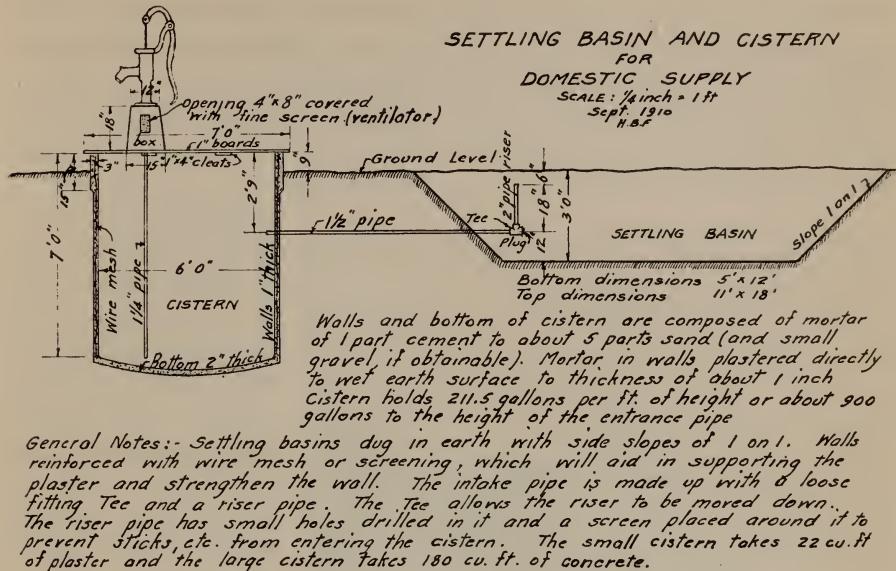


FIG. 19.—The above diagrams show a good method of constructing concrete cisterns for the storage of water.

As shown in the above diagrams, the fresh canal water is allowed to run into the settling basin where it should stand for twelve hours or more to allow the sediment to settle to the bottom. The clear surface

water is then allowed to flow into the concrete cistern and the settling basin then left to dry until the cistern is ready to be refilled. This tends to prevent the growth of plant life and insects in the settling basins.

The water can be removed from the cistern by means of hand pumps, windmills, or gasoline engines. Many people in Imperial County are of the opinion that the wind in the valley is not constant enough throughout the year to make the use of windmills reliable.

The cost of constructing the cement cistern shown in diagram No. 1, which is recommended for the storage of water for household supply, has been estimated at \$40.00.

Although there are comparatively few windmills being used, the experience of those using them, as shown by the following data, seems sufficient evidence of the fact that they are of practical use in that section for pumping water:



FIG. 20.—Windmills and tanks near Calexico used for supplying water for live stock.

2. Mr. B.—With one windmill and a 1,000-gallon tank supplied water satisfactorily for six horses and the household.

3. Mr. C.—One windmill pumped water for household use and was satisfactory, except that the tank not being covered allowed the water to get hot in summer.

4. Mr. D.—Has one windmill and is satisfied with it.

5. Mr. E.—Has one windmill raising water to tank thirty feet high, also has electric motor for emergency, but has not had occasion to use it during the past two years.

6. Mr. F.—Has one windmill and tank for stock and household use, and reports it satisfactory at all times.

7. Brawley City—Used windmill for over two years, which supplied all the water for domestic purposes for about five hundred people.

REPORT OF SPECIAL INVESTIGATIONS IN IMPERIAL COUNTY, JUNE 5 TO 15, 1911.

By F. M. HAYES, D.V.M.

Since Dr. Roadhouse made his investigation of the live stock industry in Imperial County, as recorded in the preceding pages, the Veterinary Division of the California Agricultural Experiment Station has received many letters from residents of the valley, indicating that there existed a serious disease among the hogs which was the cause of no little alarm to the men interested in this branch of animal industry in the valley. The writer was subsequently authorized to make an investigation, and, if possible, to determine the cause of the disease. In addition to this investigation, the general condition of all kinds of live stock was to be studied as well as could be in the limited space of time allowed, and whatever help possible was to be extended to the growers.

This report deals particularly with the disease that has been responsible for the loss of so many hogs, and suggests methods of relieving the condition. The investigation had not proceeded far when it appeared evident that most of the losses, during the spring and early summer months, were produced by an attenuated form of hog cholera. A seeming peculiarity of this type of cholera was that it attacked mostly the little pigs just before or shortly after weaning time, and that the infected pigs often lingered from ten days to two or three weeks, and some even recovered. Many of the larger hogs were entirely immune to attacks. This condition, however, was not constant because herds were located in which the type was particularly virulent; the large hogs and shoats dying rapidly. During the investigations, June 5 to 15, 1911, twenty-six hog ranches were visited, on which there was a total of about ten thousand hogs; twenty-one post-mortems were held. On these hog ranches approximately two thousand hogs, mostly small pigs, have died during the spring. An effort was made to examine hogs on ranches where diverse methods of handling prevailed in order to study the disease under different conditions and to note the effect of each.

DISEASES OF LIVE STOCK NOT DESCRIBED IN THE PRECEDING REPORT.

Hog Cholera.

Hog cholera is due to infection with a specific virus and can not occur except through the transmission of infectious material from diseased to susceptible hogs.

Causes of the disease:

The causes of hog cholera may be divided into two classes: first, the predisposing conditions, usually known as accessory causes; and, second,

the exciting cause, which is an invisible germ, so small that it has not even been removed from the tissues by the finest filter.

A brief outline of the causes of this disease with special reference to the conditions in Imperial Valley would seem to be important at this point for at least two reasons: first, so that the hog-raiser might be able to recognize conditions that would predispose hogs to cholera, and knowing these conditions, intelligent methods may be inaugurated toward prevention before the disease has appeared; second, after the disease appears in the herds in the neighborhood, that proper measures for preventing well hogs from becoming infected, and efficient disinfection of carcasses, bedding and pens may be undertaken.

In considering the causes of any infectious disease, the first, and, particularly in this valley, the most important, are the accessory or predisposing causes. Among them may be mentioned (1) colds and other congestion produced by lack of shelter during cool nights that follow warm or hot days; (2) insufficient shelter during very hot weather has a tendency to weaken the natural resistance of hogs to disease; (3) improper feeding, such as unbalanced rations causing alterations in nutrition and intestinal troubles; (4) impure water for drinking purposes. The hog requires clean water, just as much as any animal, for proper growth and development. Stagnant water is a favorable place for the multiplication of most bacteria and fungi that happen to be present in it; (5) the free access to muddy wallows during all times of the year. Many of these wallows in Imperial Valley are made by excavating an area, filling it with water from an irrigating ditch, and the hogs are then allowed to lie in the mud that forms, and even to drink the water. In some regions this mud clings to them for days. Wallows are unnecessary at any time, except, possibly, during the extremely hot weather that prevails in Imperial Valley during the summer, and even then they are of doubtful benefit; (6) insanitary condition of pens used for farrowing. These are the places where the little pigs first find their enemies of health. In pens that are dirty, non-disinfected, dusty or muddy lie opportunities for the breeding of external and internal parasitic diseases, intestinal troubles, sore mouth, sore eyes, etc., all of which tend to weaken the hog and lessen his immunity to cholera.

Hogs subject to predisposing conditions as above mentioned are ready victims to the exciting cause of cholera. Hog cholera is a disease which is highly infectious among hogs, and spreads from herd to herd with great rapidity. All of the bodily secretions and excretions are supposed to be capable of producing the disease, but more especially the urine and intestinal excretions. Hogs not yet infected are thus exposed to this virulent material by contact with sick hogs in the same field. Often when a hog dies in a herd the owner thinks little of it, and fails to

destroy the carcass, either leaving it for his hogs to eat or throwing it outside the field. Here crows, buzzards, dogs, rabbits, or other animals feed upon it, carrying away bits of it on the beaks or claws to some other hogpen and set up another center of disease. The same may take place by feeding upon the excretions of sick hogs. Attendants are often responsible for the spread of cholera by walking through infected pens and then visiting a neighboring herd. Another fruitful source of scattering cholera is by streams of water. Many outbreaks have occurred along the course of a stream of water that has flowed through diseased pens. This latter has an especial significance in irrigated regions because this water may be used for irrigating and the infection spread over large areas or carried from one farm to another. This is probably responsible for many of the outbreaks in Imperial Valley, because, either from gross negligence or from ignorance of the existence of cholera, many farmers have allowed dead hogs to lie in fields over which irrigation water flows, or have disposed of the hogs by throwing them in or alongside an irrigating ditch. One case was noted where a wagon load of dead pigs had been deposited at the edge of the desert as a feast for crows, buzzards, and other animals.

Symptoms and Post-mortem Appearances. Although the symptoms and lesions of hog cholera may vary in different herds, and in individual hogs of the same herd, under varying conditions of feeding, watering, handling, climate, season, housing, natural resistance, and mixed infections, yet there are a few symptoms of which the farmer may become suspicious and lesions of which he may be certain.

The most common symptoms are loss of appetite, lassitude, and a disposition to lie with the head under the litter with no desire to follow the herd in feeding. The back may be arched and the bristles erected. Accompanying this there may be a cough and a discharge from the eyes and nose. In dusty pens, or if the hog has access to muddy water, this discharge from the eyes becomes hardened, completely closing the eyes, and causing an irritation which often results in loss of sight. During this time the bodily temperature has risen; constipation, or diarrhoea, usually of a yellowish color, is present, and the hog has difficulty in supporting itself upon its hind legs, swaying from side to side as he attempts to walk. His head and ears hang down, exhibiting the general appearance of little energy. This condition may last from four to fourteen days, or even longer, depending upon the virulence of the infecting agent and the resistance of the animal. Death may take place without the knowledge of premonitory symptoms.

All farmers should either post-mortem every hog that dies under circumstances at all suspicious, or have the work done by a competent veterinarian, who should be able to recognize any lesions indicating the presence of an infectious disease in the herd. These conditions, if

recognized early and proper methods of isolation instituted, might prevent the general dissemination of the disease throughout the herd.

In cases of hog cholera the lesions will vary according to the course of the disease, but the following are usually present: The skin along the belly, between the hams and around the ears, often shows a reddish-purple discoloration. Slight inflammation of the bladder is present and is shown by redness of its lining; haemorrhagic spots appear on the kidneys varying in size from the point to the head of a pin. The kidneys may be thickly covered with these spots or possibly only a few of them may be seen by stripping off the envelope of the kidney. The spleen is usually enlarged, congested, black and friable. Inflammation of the intestines, more especially the mucous membrane of the cæcum or beginning of the large intestine, often occurs. This inflammation may be diffuse or in the form of ulcers, depending upon whether the acute or the chronic type of the disease exists. Diffuse inflammation of the inner surface of the stomach, congestion of the lymphatic glands along the intestines and between the lungs, haemorrhagic spots on the lungs varying from one eighth inch to entire congestion of all the lobes with accompanying loss of function, is frequently seen. Inflammation of the covering of the heart may also exist. Examination for these changes should be made as soon as possible after death of the animal. Diagnosis may be more certain by destroying a very sick pig and an examination made.

Treatment. This consists largely of prevention because no known drug has been demonstrated to cure hog cholera. Prevention may be carried out along the following lines: (1) By procuring a knowledge of conditions that predispose to cholera as suggested under predisposing causes and avoiding them as far as possible; (2) By thorough disinfection of dead pigs, pens, and bedding, in fact, everything that has come in contact with the diseased animals; (3) By vaccination with a serum prepared from the blood of a highly immunized hog. This serum has given uniformly good results in other states when applied to well hogs, and the Agricultural Experiment Station of the University of California will be prepared in the near future to supply this serum for vaccination at a cost that will mean thousands of dollars saved to the hog owner.

Sore Mouth in Pigs. This is a condition found only in little pigs during the suckling period. Abrasions of the lips and mucous membrane of the mouth are caused by the sharp teeth of the pig, and by fighting to reach the mother's udder. Infection usually follows from dirt in the pens and mud on the teats of the sow. This condition has been referred to in the preceding report.

Symptoms. If caused by the pigs' own teeth, the abrasion usually takes place on the sides of the mouth which come in contact with the sharp canine teeth. If from fighting one another, the lesion may be

located any place on the lips or mouth. When infection takes place necrosis begins, and parts of the lips may slough away with the formation of a disagreeable odor. Inflammation may extend all around the lips and snout with considerable swelling.

Treatment. When this condition is discovered the infected pigs should be treated individually by a thorough disinfection of the wounds with five per cent carbolic acid, cresol or some like efficient disinfectant. Tincture of iodine painted on the area after cleansing will often check the extension and promote healing. The pigs should be treated daily until relieved and kept in as clean quarters as possible. The mother's udder should be washed in a disinfectant as an additional precaution.

Diarrhea in Little Pigs. The cause of this trouble is usually an abrupt change of feed, either of the mother or of the pigs. An exclusive diet of alfalfa is responsible for some of the intestinal irritation, shown by a watery green diarrhea appearing a few days after feeding upon alfalfa. Most of the animals recover after several days purging, but some succumb from weakness. Another source of the trouble is dirty, unsanitary surroundings with stagnant water for drinking purposes.

Treatment naturally should consist in a change of the conditions so far as possible. A change of feed should be given gradually, and in alfalfa feeding a little grain is indicated until the pigs become accustomed to the alfalfa ration.

Chronic Cough of Swine. In hot, dry and dusty regions, as well as in a cold, damp climate, this condition prevails in shoats and to a less extent in large hogs. The dust irritates the bronchial tubes and lungs and produces a deep cough. Pigs are not usually very sick unless complications arise, which is frequently the case, but it causes an unthrifty condition and the growth is not satisfactory.

The treatment should consist of isolation of the sick hogs by removing the well ones. The pens should be disinfected and free from dust. A tonic condition powder is recommended in this trouble as well as in diarrhoea. The following powder is endorsed by the U. S. Department of Agriculture:

Wood charcoal	-----	1 pound.
Sulphur	-----	1 pound.
Antimony sulphide	-----	1 pound.
Common salt	-----	2 pounds.
Sodium bicarbonate	-----	2 pounds.
Sodium hyposulphite	-----	2 pounds.
Sodium sulphate	-----	1 pound.

A teaspoonful to every 100 pounds of hog should be mixed in the feed once each day.

Blackleg in Calves. A few cases of blackleg have been reported from Imperial County, but the situation is being controlled by the use of

blackleg vaccine, which is an efficient method of combating the disease. A circular describing this disease and the method for its prevention can be obtained by application to the Director of the Agricultural Experiment Station, Berkeley, California.

Bronchitis in Calves. A number of farmers have reported the loss of a few calves from this trouble. It is brought about by lack of shelter during the extremely hot days of the summer and cool nights in the winter. Either extreme heat or cold is likely to produce congestion. This, combined with the dust found in Imperial Valley, is sufficient to cause an inflammation of the air passages. In some cases a chronic form develops. Pneumonia and pus foci in the lungs are complications which may follow.

Symptoms. Calves affected will show a general feverish condition with a rise of temperature; serous discharge from the nose followed by a mucus; the back is often arched, the hair rough; eyes watery and red, and a moist, deep cough which is aggravated by pressure on the trachea or over the lungs. Constipation may be present.

Treatment. The causes should be removed as far as possible. Shelter should be provided from the hot sun and from draughts during the cool night. Medicinal treatment may consist of two or three ounces of Epsom salts with one dram of ginger given as a drench in milk. Hot inhalations of creosote may relieve the congestion along the air passages. The disease is not usually fatal, terminating in recovery in five or ten days if no complications arise. A three per cent boric acid solution applied to the inflamed eyes will check the inflammation.

Some Methods of Disinfection Following Infectious Diseases. In all places where an infectious disease has occurred, thorough disinfection of all the premises should take place. A good disinfectant, such as creolin, cresol or some of the reliable coal tar dips on the market or kerosene emulsion, the preparation of which is given in the first part of this bulletin, should be used. All litter and bedding may be piled and burned. The disinfectants should then be applied with a spray pump. Slaked lime should be thrown on the ground or floor after the disinfection. Lots or pastures too large to disinfect in this manner may be plowed up and sown to a crop or allowed to stand unpastured for a year. In a diseased herd the well animals should be sprayed or dipped with a disinfectant and taken from the sick quarters to clean disinfected pens. Carcasses of dead animals should either be buried six feet under ground or burned to ashes, preferably the latter. Quarantine pens ought to be maintained in which new stock purchased should remain for at least four weeks, previously being subjected to a spray of disinfectant.

Summary. From the writer's (F. M. Hayes) investigations in Imperial Valley, the following conclusions have been drawn:

(1) Imperial Valley possesses excellent conditions for the production of live stock.

(2) In 1910, 35,000 of the 500,000 hogs in California were in this valley, which demonstrates the importance of this industry in a region but ten years old.

(3) Animal diseases are not more prevalent in Imperial County than elsewhere. Aside from the hog troubles mentioned in this paper little disease exists.

(4) The standard of hogs should be raised. The average type of hog existing in the valley is not the most economical pork producer. Inbreeding and cross-breeding are practiced to the detriment of profitable hog raising.

(5) Infection was allowed to spread, and hogs died unnecessarily because of ignorance of the existence of an infectious disease. Improper disposal of the carcasses of dead hogs and contaminated irrigation water, were also responsible for its dissemination.

(6) Many hog raisers maintain an unnecessary settling basin in which the hogs wallow. The water becomes stagnant, unhealthy for drinking purposes, and the mud clinging to the bodies of the hogs is a menace to their health. An improvement in these basins, if they are allowed to exist at all for hogs, is the concrete or board runway into the water, with fencing to keep the hogs from the mud. In addition, frequent changing of the water is necessary. These basins should be for the purpose of furnishing clean, cool water to animals according to plans similar to those of the preceding report.

(7) Sufficient shelter is not provided for hogs and other animals. In order to avoid the sun, the hogs and sheep crowd under these inadequate shelters, stirring up irritating dust to be breathed.

(8) In a large number of cases the herds of hogs are too large to be managed by the few men in charge, and proper attention to cleanliness and feeding can not be shown during farrowing time.

(9) If some of the precautions mentioned in this report are observed and anti-hog cholera serum used when necessary, the number of hogs lost in the future will be materially reduced and the profits proportionally increased.

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- 1896. Report of the Viticultural Work during the seasons 1887-93, with data regarding the Vintages of 1894-95.
- 1897. Resistant Vines, their Selection, Adaptation, and Grafting. Appendix to Viticultural Report for 1896.
- 1902. Report of the Agricultural Experiment Station for 1898-1901.
- 1903. Report of the Agricultural Experiment Station for 1901-03.
- 1904. Twenty-second Report of the Agricultural Experiment Station for 1903-04.

BULLETINS.

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| <p><i>Reprint.</i> Endurance of Drought in Soils of the Arid Region.</p> <p>No. 128. Nature, Value, and Utilization of Alkali Lands, and Tolerance of Alkali. (Revised and Reprint, 1905.)</p> <p>133. Tolerance of Alkali by Various Cultures.</p> <p>147. Culture Work of the Sub-stations.</p> <p>149. California Sugar Industry.</p> <p>151. Arsenical Insecticides.</p> <p>152. Fumigation Dosage.</p> <p>153. Spraying with Distillates.</p> <p>154. Sulfur Sprays for Red Spider.</p> <p>159. Contribution to the Study of Fermentation.</p> <p>162. Commercial Fertilizers. (Dec. 1, 1904.)</p> <p>165. Asparagus and Asparagus Rust in California.</p> <p>167. Manufacture of Dry Wines in Hot Countries.</p> <p>168. Observations on Some Vine Diseases in Sonoma County.</p> <p>169. Tolerance of the Sugar Beet for Alkali.</p> <p>170. Studies in Grasshopper Control.</p> <p>171. Commercial Fertilizers. (June 30, 1905.)</p> <p>172. Further Experience in Asparagus Rust Control.</p> <p>174. A New Wine-cooling Machine.</p> <p>176. Sugar Beets in the San Joaquin Valley.</p> <p>177. A New Method of Making Dry Red Wine.</p> <p>178. Mosquito Control.</p> <p>179. Commercial Fertilizers. (June, 1906.)</p> <p>180. Resistant Vineyards.</p> <p>181. The Selection of Seed-Wheat.</p> <p>182. Analysis of Paris Green and Lead Arsenic. Proposed Insecticide Law.</p> <p>183. The California Tussock-moth.</p> <p>184. Report of the Plant Pathologist to July 1, 1906.</p> <p>185. Report of Progress in Cereal Investigations.</p> <p>186. The Oidium of the Vine.</p> | <p>No. 187. Commercial Fertilizers. (January, 1907.)</p> <p>188. Lining of Ditches and Reservoirs to Prevent Seepage and Losses.</p> <p>189. Commercial Fertilizers. (June, 1907.)</p> <p>190. The Brown Rot of the Lemon.</p> <p>191. California Peach Blight.</p> <p>192. Insects Injurious to the Vine in California.</p> <p>193. The Best Wine Grapes for California; Pruning Young Vines; Pruning the Sultanina.</p> <p>194. Commercial Fertilizers. (Dec., 1907.)</p> <p>195. The California Grape Root-worm</p> <p>197. Grape Culture in California; Improved Methods of Wine-making; Yeast from California Grapes.</p> <p>198. The Grape Leaf-Hopper.</p> <p>199. Bovine Tuberculosis.</p> <p>200. Gum Diseases of Citrus Trees in California. [1908.]</p> <p>201. Commercial Fertilizers. (June,</p> <p>202. Commercial Fertilizers. (December, 1908.)</p> <p>203. Report of the Plant Pathologist to July 1, 1909.)</p> <p>204. The Dairy Cow's Record and the Stable.</p> <p>205. Commercial Fertilizers. (December, 1909.)</p> <p>206. Commercial Fertilizers. (June, 1910.)</p> <p>207. The Control of the Argentine Ant.</p> <p>208. The Late Blight of Celery.</p> <p>209. The Cream Supply.</p> <p>210. Imperial Valley Settlers' Crop Manual.</p> <p>211. How to Increase the Yield of Wheat in California.</p> <p>212. California White Wheats.</p> <p>213. The Principles of Wine-making.</p> <p>214. Citrus Fruit Insects.</p> <p>215. The House Fly in its Relation to Public Health.</p> <p>216. A Progress Report Upon Soil and Climatic Factors Influencing the Composition of Wheat.</p> <p>217. Honey Plants of California.</p> <p>218. California Plant Diseases.</p> |
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CIRCULARS.

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| No. 1. Texas Fever. | No. 52. Information for Students Concerning the College of Agriculture. |
| 3. Hog Cholera. | 53. Announcement of Farmers' Short Courses for 1910. [Tests.] |
| 5. Contagious Abortion in Cows. | 54. Some Creamery Problems and |
| 7. Remedies for Insects. | 55. Farmers' Institutes and University Extension in Agriculture. |
| 9. Asparagus Rust. | 57. Announcement of Farmers' Short Courses in Animal Industry and Veterinary Science. |
| 11. Fumigation Practice. | 58. Experiments with Plants and Soils in Laboratory, Garden, and Field. |
| 12. Silk Culture. | 59. Tree Growing in the Public Schools. |
| 15. Recent Problems in Agriculture.
What a University Farm is For. | 60. Butter-Scoring Contest 1910. |
| 19. Disinfection of Stables. | 61. University Farm School. |
| 29. Preliminary Announcement Concerning Instruction in Practical Agriculture upon the University Farm, Davis, Cal. | 62. The School Garden in the Course of Study. |
| 30. White Fly in California. | 63. How to Make an Observation Hive. |
| 32. White Fly Eradication. | 64. Announcement of Farmers' Short Courses for 1911. |
| 33. Packing Prunes in Cans. Cane Sugar vs. Beet Sugar. | 65. California Insecticide Law. |
| 35. Southern California Pathological Laboratory and Citrus Experiment Station. | 66. Insecticides and Insect Control. |
| 36. Analyses of Fertilizers for Consumers. | 67. Development of Secondary School Agriculture in California. |
| 39. Instruction in Practical Agriculture at the University Farm. | 68. The Prevention of Hog Cholera. |
| 46. Suggestions for Garden Work in California Schools. | 69. The Extermination of Morning-glory. |
| 47. Agriculture in the High Schools. | 70. Observations on Status of Corn-growing in California. |
| 48. Butter Scoring Contest, 1909. | |
| 49. Insecticides. | |
| 50. Fumigation Scheduling. | |
| 51. University Farm School. | |